CLAIMS

We claim:

1. A color conversion method comprising:

(a) receiving RGB data representing the red (R), green (G), and blue (B) components of one or more colors;

(b) generating by circuitry, from the RGB data, data $R_g$=R-G;

(c) generating by circuitry, from the RGB data, data $B_g$=B-G;

(d) generating by circuitry, from the $R_g$ and $B_g$ data, data $P=f(R_g,B_g)$ where f is a predefined function;

(e) generating by circuitry, from the RGB data and the P data, data Y=G+P;

wherein the Y, $R_g$, and $B_g$ data represent said one or more colors.

2. The method of Claim 1 wherein the operations (b), (c), (e) are performed without rounding errors.

3. The method of Claim 1 further comprising recovering the RGB data from the Y, $R_g$, and $B_g$ data, the recovering operation comprising:

(f) generating by circuitry, from the $R_g$ and $B_g$ data, data $P=f(R_g, B_g)$;

(g) generating by circuitry, from the Y data and from the P data generated in operation (f), data Y-P, and providing the data Y-P as the recovered data G;

(h) generating by circuitry, from the $R_g$ data and from the G data provided in operation (g), data $R_g$+G, and providing the data $R_g$+G as the recovered data R;

(i) generating by circuitry, from the $B_g$ data and from the G data provided in operation (g), data $B_g$+G, and providing the data $B_g$+G as the recovered data B.

4. The method of Claim 3 wherein:

operations (g), (h), (i) are performed without rounding errors;

if an error occurs in the generation of data P in operation (d), then the same error occurs in the generation of the data P in operation (f).

5. The method of Claim 1 wherein $f(R_g, B_g) = \alpha * R_g + \beta * B_g$, where $\alpha$ and $\beta$ are predefined numbers.

6. The method of Claim 5 wherein:

$\alpha=2/8$ and $\beta=1/8$; or

$\alpha=5/16$ and $\beta=2/16$; or

$\alpha=19/64$ and $\beta=7/64$; or

$\alpha=77/256$ and $\beta=29/256$; or

$\alpha=306/1024$ and $\beta= 117/1024$.

7. The method of Claim 1 wherein the operations (b) through (e) are performed by circuitry capable of performing only one or more of the following operations: addition, subtraction, obtaining a negative of a number, and shifting.

8. The method of Claim 1 wherein said method comprises a software programmed computer processor.

9. A computer readable medium comprising one or more computer instructions for performing the method of Claim 1.

10. A color conversion method comprising:

(a) receiving $YR_gB_g$ data representing the luminance value Y and the chrominance values $R_g$, $B_g$ of one or more colors;

(b) generating by circuitry, from the $YR_gB_g$ data, data $P=f(R_g,B_g)$, where f is a predefined function;

(c) generating by circuitry, from the $YR_gB_g$ data and the P data, data $G=Y-P$;

(d) generating by circuitry, from the $YR_gB_g$ data and the G data, data $R=R_g+G$;

(e) generating by circuitry, from the $YR_gB_g$ data and the G data, data $B=B_g+G$;

wherein the R data, the G data, and the B data represent respectively the read, green, and blue components of the one or more colors.

11. The method of Claim 10 wherein the operations (c), (d), (e) are performed without rounding errors.

12. The method of Claim 10 wherein $f(R_g, B_g) = \alpha * R_g + \beta * B_g$, where $\alpha$ and $\beta$ are predefined numbers.

13. The method of Claim 12 wherein:

$\alpha$=2/8 and $\beta$=1/8; or

$\alpha$=5/16 and $\beta$=2/16; or

$\alpha$=19/64 and $\beta$=7/64; or

$\alpha$=77/256 and $\beta$=29/256; or

$\alpha$=306/1024 and $\beta$=11/1024.

14. The method of Claim 10 wherein the operations (b) through (e) are performed by circuitry capable of performing only one or more of the following operations: addition, subtraction, obtaining a negative of a number, and shifting.

15. A computer readable medium comprising one or more computer instructions for causing a computer processor to perform the method of Claim 10.

16. An apparatus comprising circuitry for:

(a) receiving RGB data representing the red (R), green (G), and blue (B) components of one or more colors;

(b) generating, from the RGB data, data $R_g$=R-G;

(c) generating, from the RGB data, data $B_g$=B-G;

(d) generating, from the $R_g$ and $B_g$ data, data $P=f(R_g,B_g)$ where f is a predefined function;

(e) generating, from the RGB data and the P data, data $Y=G+P$;

wherein the Y, $R_g$, and $B_g$ data represent said one or more colors.

17. The apparatus of Claim 16 wherein the operations (b), (c), (e) are performed without rounding errors.

18. The apparatus of Claim 16 further comprising circuitry for recovering the RGB data from the Y, $R_g$, and $B_g$ data, the recovering operation comprising:

(f) generating, from the $R_g$ and $B_g$ data, data $P=f(R_g, B_g)$;

(g) generating, from the Y data and from the P data generated in operation (f), data Y-P, and providing the data Y-P as the recovered data G;

(h) generating, from the $R_g$ data and from the G data provided in operation (g), data $R_g+G$, and providing the data $R_g+G$ as the recovered data R;

(i) generating, from the $B_g$ data and from the G data provided in operation (g), data $B_g+G$, and providing the data $B_g+G$ as the recovered data B.

19. The apparatus of Claim 18, wherein:

operations (g), (h), (i) are performed without rounding errors;

if an error occurs in the generation of data P in operation (d), then the same error occurs in the generation of the data P in operation (f).

20. The apparatus of Claim 16 wherein $f(R_g, B_g) =\alpha*R_g+\beta*B_g$, where $\alpha$ and $\beta$ are predefined numbers.

21. The apparatus of Claim 20 wherein:

$\alpha=2/8$ and $\beta=1/8$; or

$\alpha=5/16$ and $\beta=2/16$; or

$\alpha$=19/64 and $\beta$=7/64; or

$\alpha$=77/256 and $\beta$=29/256; or

$\alpha$=306/1024 and $\beta$=117/1024.

22. The apparatus of Claim 16 wherein the operations (b) through (e) are performed by circuitry capable of performing only one or more of the following operations: addition, subtraction, obtaining a negative of a number, and shifting.

23. An apparatus comprising circuitry for:

(a) receiving $YR_gB_g$ data representing the luminance value Y and the chrominance values $R_g$, $B_g$ of one or more colors;

(b) generating, from the $YR_gB_g$ data, data $P=f(R_g,B_g)$, where f is a predefined function;

(c) generating, from the $YR_gB_g$ data and the P data, data $G=Y-P$;

(d) generating, from the $YR_gB_g$ data and the G data, data $R=R_g+G$;

(e) generating, from the $YR_gB_g$ data and the G data, data $B=B_g+G$;

wherein the R data, the G data, and the B data represent respectively the read, green, and blue components of the one or more colors.

24. The apparatus of Claim 23 wherein the operations (c), (d), (e) are performed without rounding errors.

25. The apparatus of Claim 23 wherein $f(R_g, B_g) = \alpha * R_g + \beta * B_g$, where $\alpha$ and $\beta$ are predefined numbers.

26. The apparatus of Claim 25 wherein:

$\alpha$=2/8 and $\beta$=1/8; or

$\alpha$=5/16 and $\beta$=2/16; or

$\alpha$=19/64 and $\beta$=7/64; or

$\alpha$=77/256 and $\beta$=29/256; or

$\alpha$=306/1024 and $\beta$=117/1024.

27. The apparatus of Claim 23 wherein the operations (b) through (e) are performed by circuitry capable of performing only one or more of the following operations: addition, subtraction, obtaining a negative of a number, and shifting.

28. A color conversion method comprising:

receiving RGB data representing red (R), green (G), and blue (B) components of one or more colors;

generating by circuitry, from the RGB data, luminance data Y and chrominance data $R_g$ and $B_g$, wherein:

$Y = \alpha*R + (1-\alpha-\beta)*G + \beta*B$

and one of the following conditions holds true:

(a) $\alpha$=2/8 and $\beta$=1/8; or

(b) $\alpha$=5/16 and $\beta$=2/16; or

(c) $\alpha$=19/64 and $\beta$=7/64; or

(d) $\alpha$=77/256 and $\beta$=29/256; or

(e) $\alpha$=306/1024 and $\beta$=117/1024.

29. The method of Claim 28 wherein $R_g$=R-G and $B_g$=B-G.

30. The method of Claim 28 wherein the condition (a) holds true.

31. The method of Claim 28 wherein the condition (b) holds true.

32. The method of Claim 28 wherein the condition (c) holds true.

33. The method of Claim 28 wherein the condition (d) holds true.

34. The method of Claim 28 wherein the condition (e) holds true.

35. An apparatus comprising circuitry for:

receiving RGB data representing red (R), green (G), and blue (B) components of one or more colors;

generating, from the RGB data, luminance data Y and chrominance data $R_g$ and $B_g$, wherein:

$Y = \alpha^*R + (1-\alpha-\beta)^*G + \beta^*B$

and one of the following conditions holds true:

(a) $\alpha$=2/8 and $\beta$=1/8; or

(b) $\alpha$=5/16 and $\beta$=2/16; or

(c) $\alpha$=19/64 and $\beta$=7/64; or

(d) $\alpha$=77/256 and $\beta$=29/256; or

(e) $\alpha$=306/1024 and $\beta$=117/1024.

36. The apparatus of Claim 35 wherein $R_g$=R-G and $B_g$=B-G.

37. The apparatus of Claim 35 wherein the condition (a) holds true.

38. The apparatus of Claim 35 wherein the condition (b) holds true.

39. The apparatus of Claim 35 wherein the condition (c) holds true.

40. The apparatus of Claim 35 wherein the condition (d) holds true.

41. The apparatus of Claim 35 wherein the condition (e) holds true.

42. A color conversion method comprising:

receiving $YR_gB_g$ data representing a luminance value Y and chrominance values $R_g$, $B_g$ for one or more colors;

generating by circuitry, from the $YR_gB_g$ data, RGB data for the one or more colors, the RGB data comprising red (R), green (G), and blue (B) components of the one or more colors, wherein:

$R=Y+(1-\alpha)*R_g-\beta*B_g;$

$G=Y-\alpha*R_g-\beta*B_g;$

$B=Y-\alpha*R_g+(1-\beta)*B_g;$

and one of the following conditions holds true:

(a) $\alpha=2/8$ and $\beta=1/8$; or

(b) $\alpha=5/16$ and $\beta=2/16$; or

(c) $\alpha=19/64$ and $\beta=7/64$; or

(d) $\alpha=77/256$ and $\beta=29/256$; or

(e) $\alpha=306/1024$ and $\beta=117/1024$.

43. The method of Claim 42 wherein the condition (a) holds true.

44. The method of Claim 42 wherein the condition (b) holds true.

45. The method of Claim 42 wherein the condition (c) holds true.

46. The method of Claim 42 wherein the condition (d) holds true.

47. The method of Claim 42 wherein the condition (e) holds true.

48. An apparatus comprising circuitry for:

receiving $YR_gB_g$ data representing a luminance value Y and chrominance values $R_g$, $B_g$ for one or more colors;

generating, from the $YR_gB_g$ data, RGB data for the one or more colors, the RGB data comprising red (R), green (G), and blue (B) components of the one or more colors, wherein:

$R=Y+(1-\alpha)*R_g-\beta*B_g$;

$G=Y-\alpha*R_g-\beta*B_g$;

$B=Y-\alpha*R_g+(1-\beta)*B_g$;

and one of the following conditions holds true:

(a) $\alpha=2/8$ and $\beta=1/8$; or

(b) $\alpha=5/16$ and $\beta=2/16$; or

(c) $\alpha=19/64$ and $\beta=7/64$; or

(d) $\alpha=77/256$ and $\beta=29/256$; or

(e) $\alpha=306/1024$ and $\beta=117/1024$.

49. The apparatus of Claim 48 wherein the condition (a) holds true.

50. The apparatus of Claim 48 wherein the condition (b) holds true.

51. The apparatus of Claim 48 wherein the condition (c) holds true.

52. The apparatus of Claim 48 wherein the condition (d) holds true.

53. The apparatus of Claim 48 wherein the condition (e) holds true.

54. A color conversion method comprising:

receiving RGB data representing red (R), green (G), and blue (B) components of one or more colors;

generating by circuitry, from the RGB data, luminance data Y and chrominance data $R_g$ and $B_g$, wherein:

$Y = \alpha*R + (1-\alpha-\beta)*G + \beta*B$;

wherein $\alpha$ and $\beta$ are numbers which minimize a coefficient

$$Kd = \frac{\sqrt{(\alpha - 0.299)^2 + (1 - \alpha - \beta - 0.587)^2 + (\beta - 0.114)^2}}{\sqrt{0.299^2 + 0.587^2 + 0.114^2}} \times 100\%$$

over all possible values of $\alpha$ and $\beta$ such that $\alpha = m/2^k$ and $\beta = n/2^k$, wherein m, n, and k are integer numbers, wherein k is a fixed number greater than or equal to 3, and m and n vary so that:

$0 \leq \alpha \leq 1$;

$0 \leq \beta \leq 1$; and

$0 \leq \alpha + \beta \leq 1$.

55. The method of Claim 54 wherein $R_g$=R-G and $B_g$=B-G.

56. The method of Claim 54 wherein the RGB data comprise R data, G data and B data each of which is represented in said circuitry as an integer.

57. The method of Claim 54 wherein $k \leq 10$.

58. An apparatus comprising circuitry for:

receiving RGB data representing red (R), green (G), and blue (B) components of one or more colors;

generating, from the RGB data, luminance data Y and chrominance data $R_g$ and $B_g$, wherein:

$Y = \alpha*R + (1-\alpha-\beta)*G + \beta*B$;

wherein $\alpha$ and $\beta$ are numbers which minimize a coefficient

$$Kd = \frac{\sqrt{(\alpha - 0.299)^2 + (1 - \alpha - \beta - 0.587)^2 + (\beta - 0.114)^2}}{\sqrt{0.299^2 + 0.587^2 + 0.114^2}} \times 100\%$$

over all possible values of $\alpha$ and $\beta$ such that $\alpha = m/2^k$ and $\beta = n/2^k$, wherein m, n, and k are integer numbers, wherein k is a fixed number greater than or equal to 3, and m and n vary so that:

$0 \leq \alpha \leq 1$;

$0 \leq \beta \leq 1$; and

$0 \leq \alpha + \beta \leq 1$.

59. The apparatus of Claim 58 wherein $R_g$=R-G and $B_g$=B-G.

60. The apparatus of Claim 58 wherein the RGB data comprise R data, G data and B data each of which is represented in said apparatus as an integer.

61. The apparatus of Claim 58 wherein $k \leq 10$.

62. A color conversion method comprising:

receiving $YR_gB_g$ data representing a luminance value and chrominance values $R_g$, $B_g$ for one or more colors;

generating by circuitry, from the $YR_gB_g$ data, RGB data for the one or more colors, the RGB data comprising red (R), green (G), and blue (B) components of the one or more colors, wherein:

$R = Y + (1-\alpha)*R_g - \beta*B_g$;

$G = Y - \alpha*R_g - \beta*B_g$;

$B = Y - \alpha*R_g + (1-\beta)*B_g$;

wherein α and β are numbers which minimize a coefficient

$$Kd = \frac{\sqrt{(\alpha - 0.299)^2 + (1 - \alpha - \beta - 0.587)^2 + (\beta - 0.114)^2}}{\sqrt{0.299^2 + 0.587^2 + 0.114^2}} \times 100\%$$

over all possible values of α and β such that $\alpha = m/2^k$ and $\beta = n/2^k$, wherein m, n, and k are integer numbers, wherein k is a fixed number greater than or equal to 3, and m and n vary so that:

$0 \leq \alpha \leq 1$;

$0 \leq \beta \leq 1$; and

$0 \leq \alpha + \beta \leq 1$.

63. The method of Claim 62 wherein the RGB data comprise R data, G data and B data each of which is represented in said circuitry as an integer.

64. The method of Claim 62 wherein $k \leq 10$.

65. An apparatus comprising circuitry for:

receiving $YR_gB_g$ data representing a luminance value and chrominance values $R_g$, $B_g$ for one or more colors;

generating, from the $YR_gB_g$ data, RGB data for the one or more colors, the RGB data comprising red (R), green (G), and blue (B) components of the one or more colors, wherein:

$R=Y+(1-\alpha)*R_g-\beta*B_g$;

$G=Y-\alpha*R_g-\beta*B_g$;

$B=Y-\alpha*R_g+(1-\beta)*B_g$;

wherein α and β are numbers which minimize a coefficient

$$Kd = \frac{\sqrt{(\alpha - 0.299)^2 + (1 - \alpha - \beta - 0.587)^2 + (\beta - 0.114)^2}}{\sqrt{0.299^2 + 0.587^2 + 0.114^2}} \times 100\%$$

over all possible values of α and β such that $\alpha=m/2^k$ and $\beta=n/2^k$, wherein m, n, and k are integer numbers, wherein k is a fixed number greater than or equal to 3, and m and n vary so that:

$0\leq\alpha\leq1$;

$0\leq\beta\leq1$; and

$0\leq\alpha+\beta\leq1$.

66. The apparatus of Claim 65 wherein the RGB data comprise R data, G data and B data each of which is represented in said circuitry as an integer.

67. The apparatus of Claim 65 wherein $k\leq10$.